

A Simulation Gaming Approach to Micro-Grid Design and Planning: Participatory Design and Capacity Building



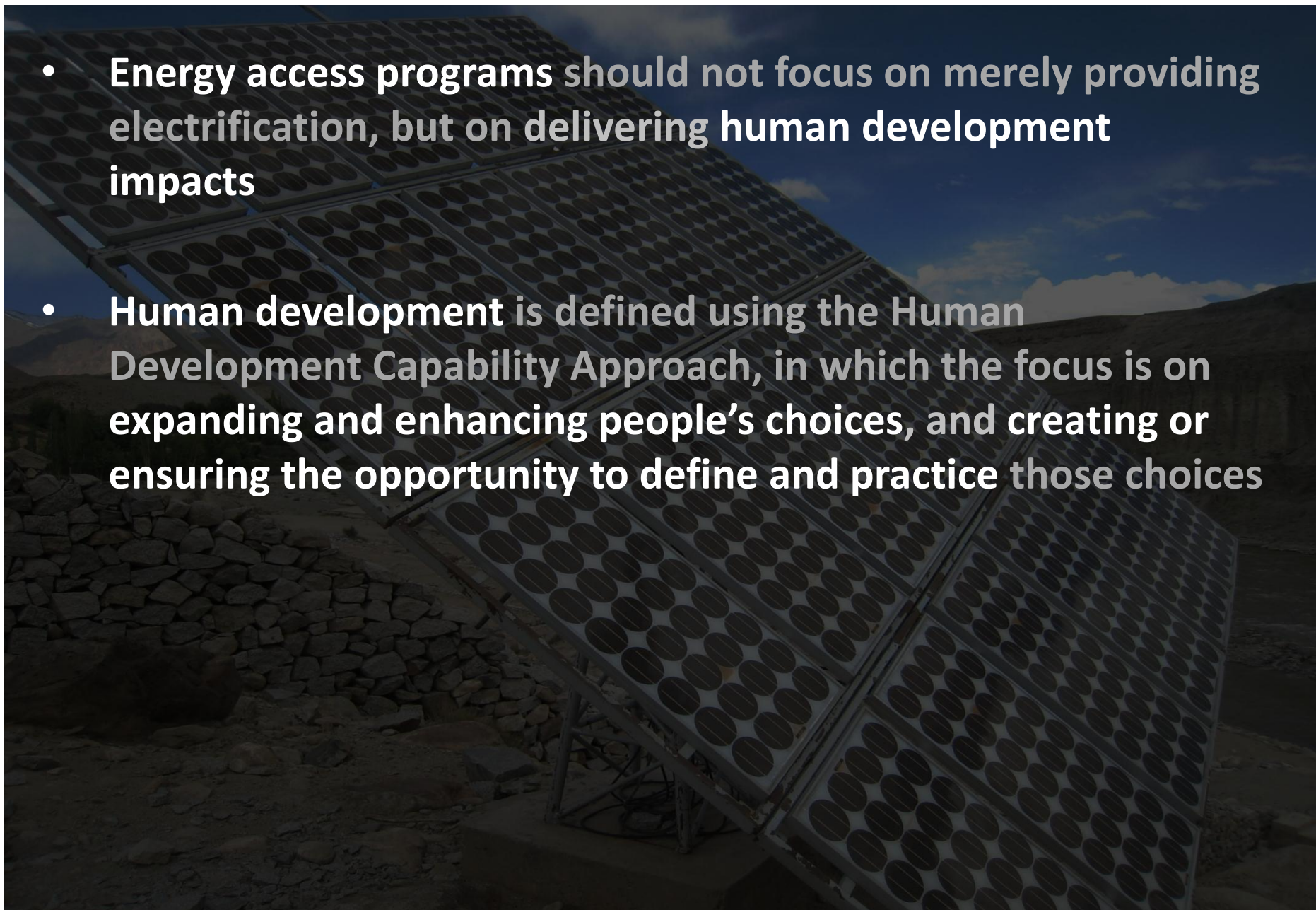
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Innovating Energy Access for Remote Areas: Discovering Untapped Resources

April 10, 2014

Berkeley, CA

- **Energy access programs should not focus on merely providing electrification, but on delivering human development impacts**
- **Human development is defined using the Human Development Capability Approach, in which the focus is on expanding and enhancing people's choices, and creating or ensuring the opportunity to define and practice those choices**





Community-based micro-hydro project cycle by TONIBUNG in East Malaysia

Motivation for capacity building in the design phase:

- A better understanding of end user needs and requirements
- Improved energy system design that leverages understanding of user needs and local capacity
- Agency and ownership of the energy system

Even delayed participation affects design, implementation and agency.

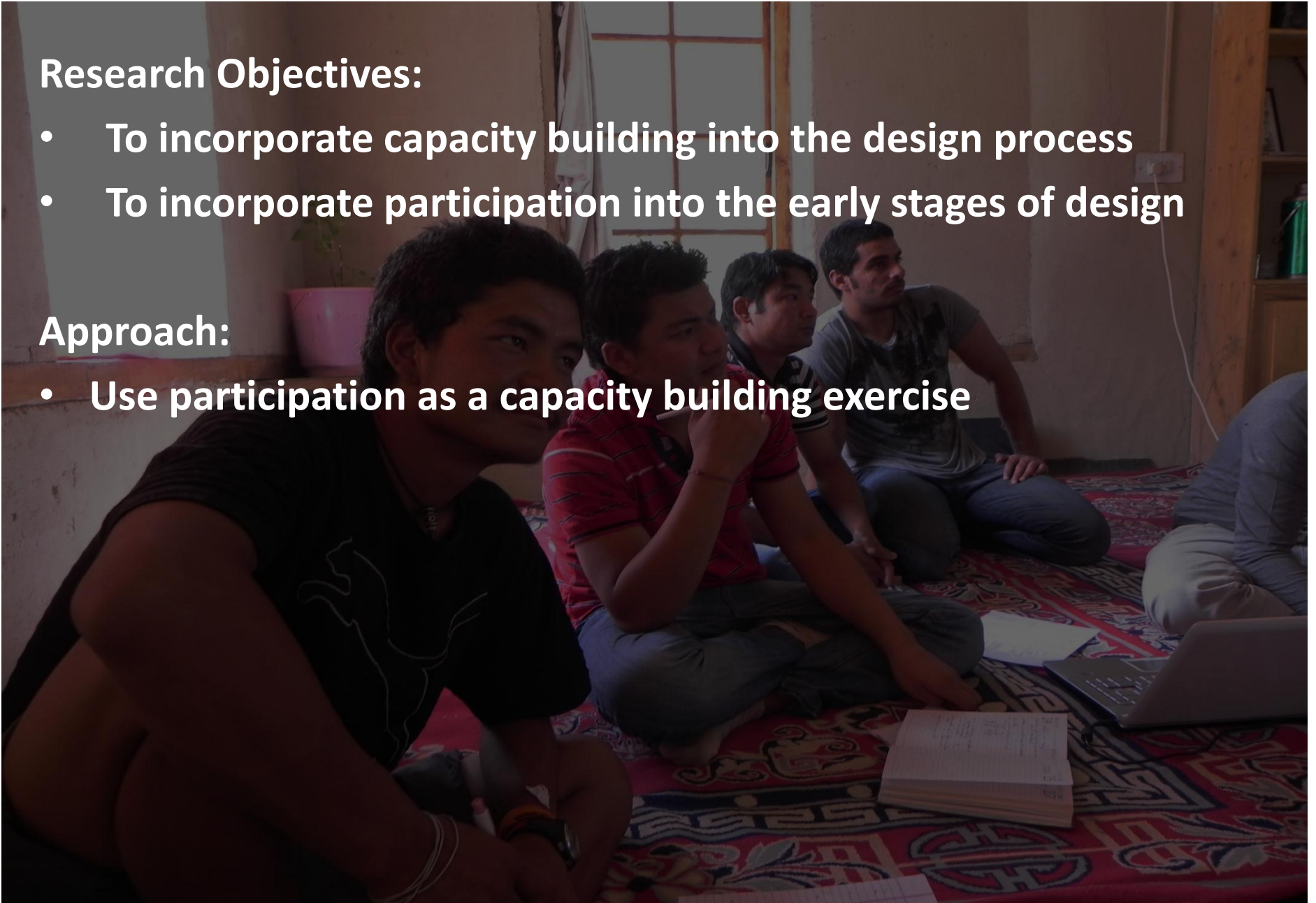


Research Objectives:

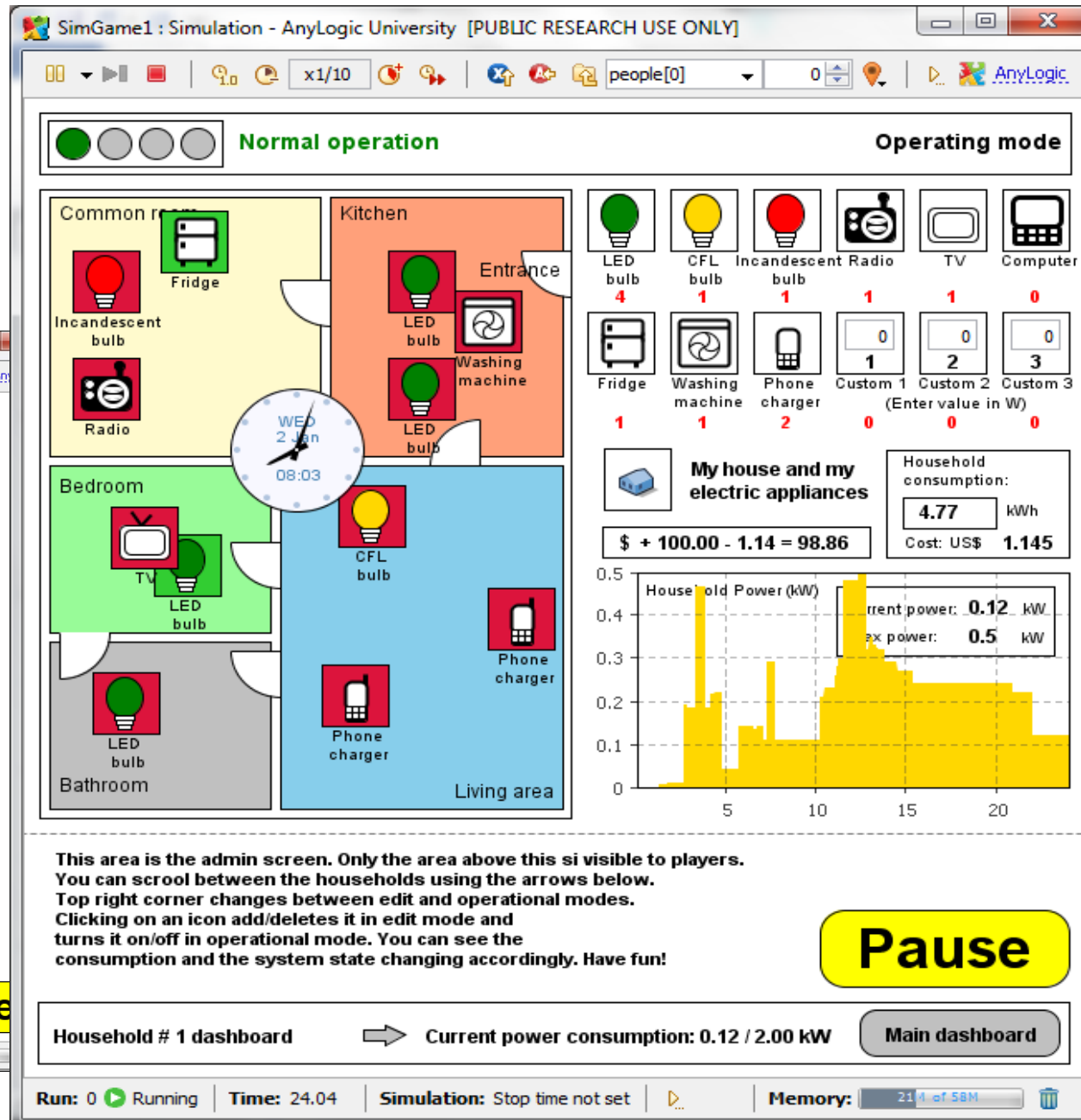
- To incorporate capacity building into the design process
- To incorporate participation into the early stages of design

Approach:

- Use participation as a capacity building exercise



A simulation game: A participatory design tool and process



Pause

The simulation game tool:

System operator
(facilitator)

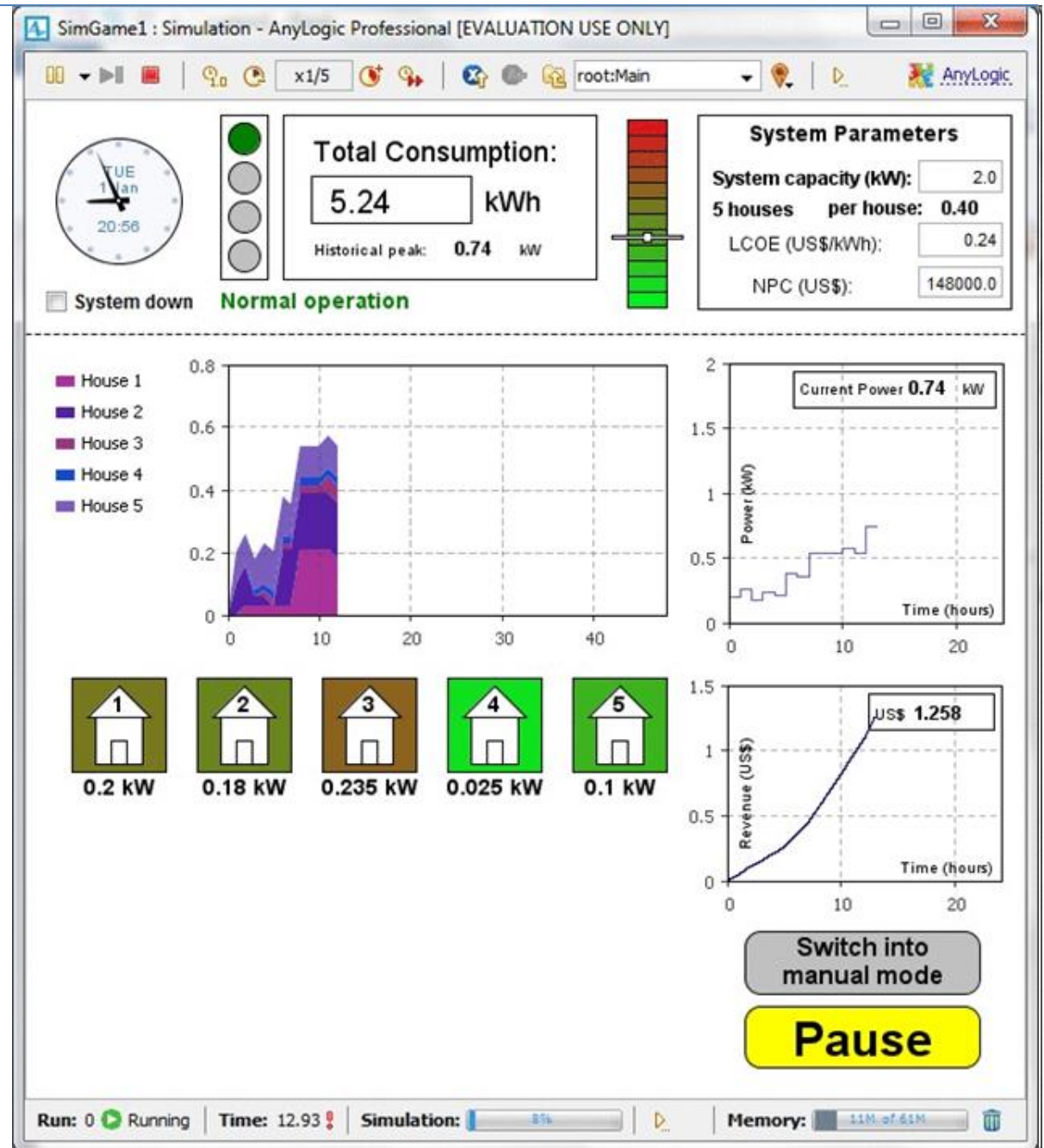


Household
player

Household
player

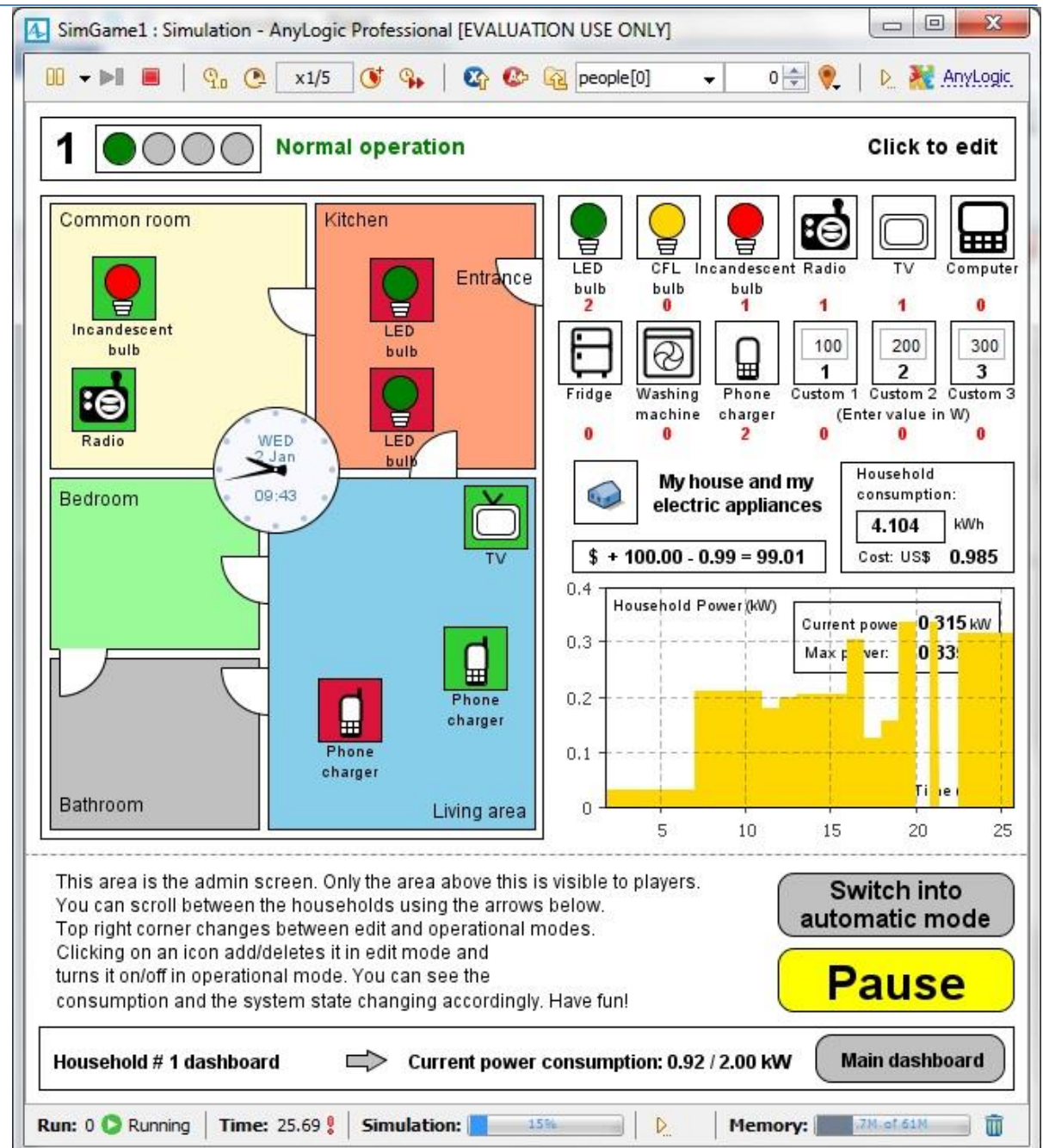
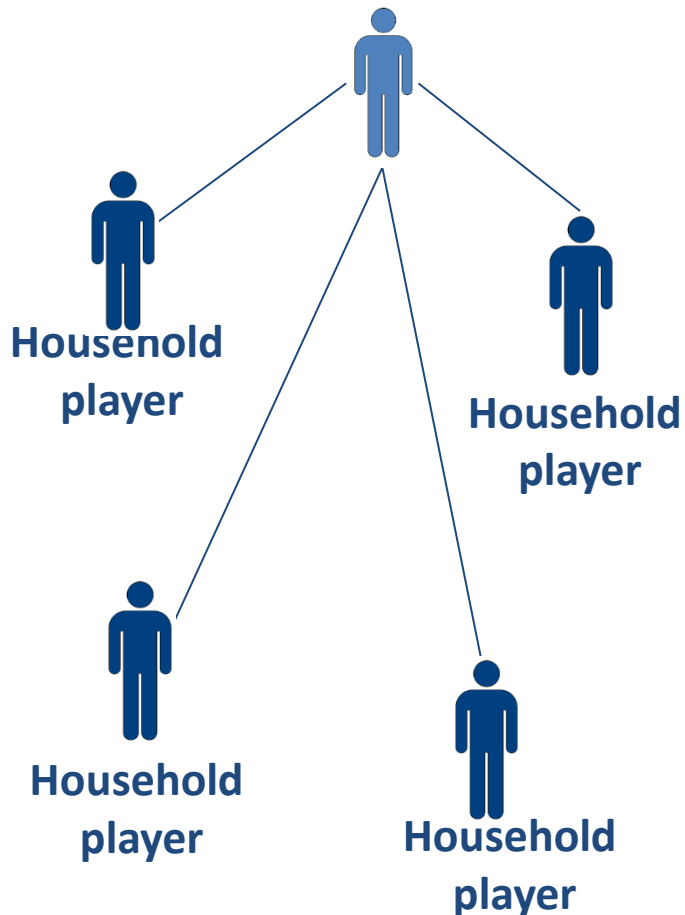
Household
player

Household
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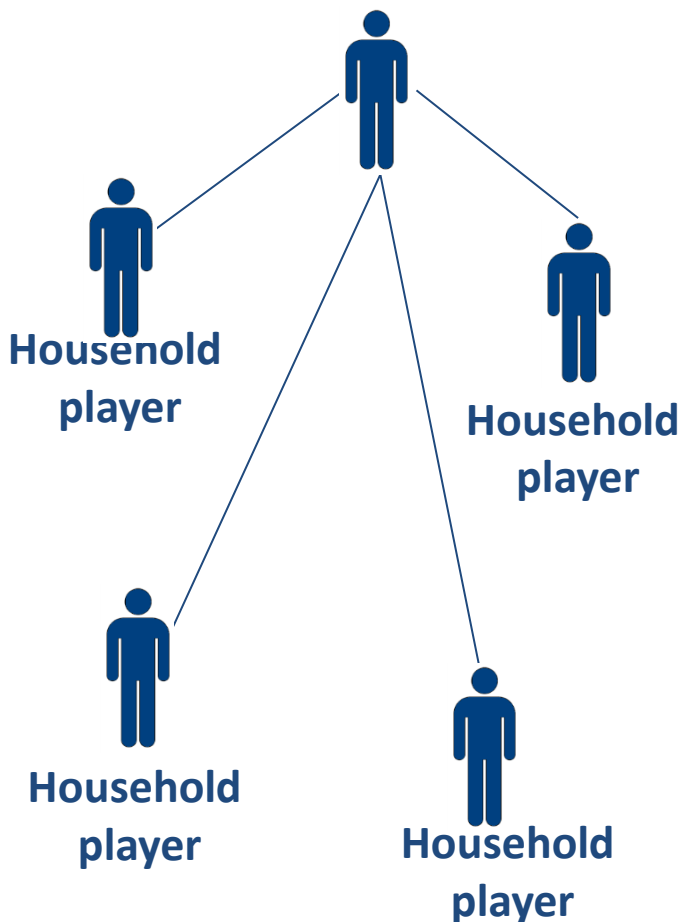


The simulation game tool:

System operator
(facilitator)



System operator (facilitator)



The simulation game process:

Facilitate discussions on

- Physical limitations of micro-grid
- Household consumption and load profiles
- Costs and expenditure
- Resource management

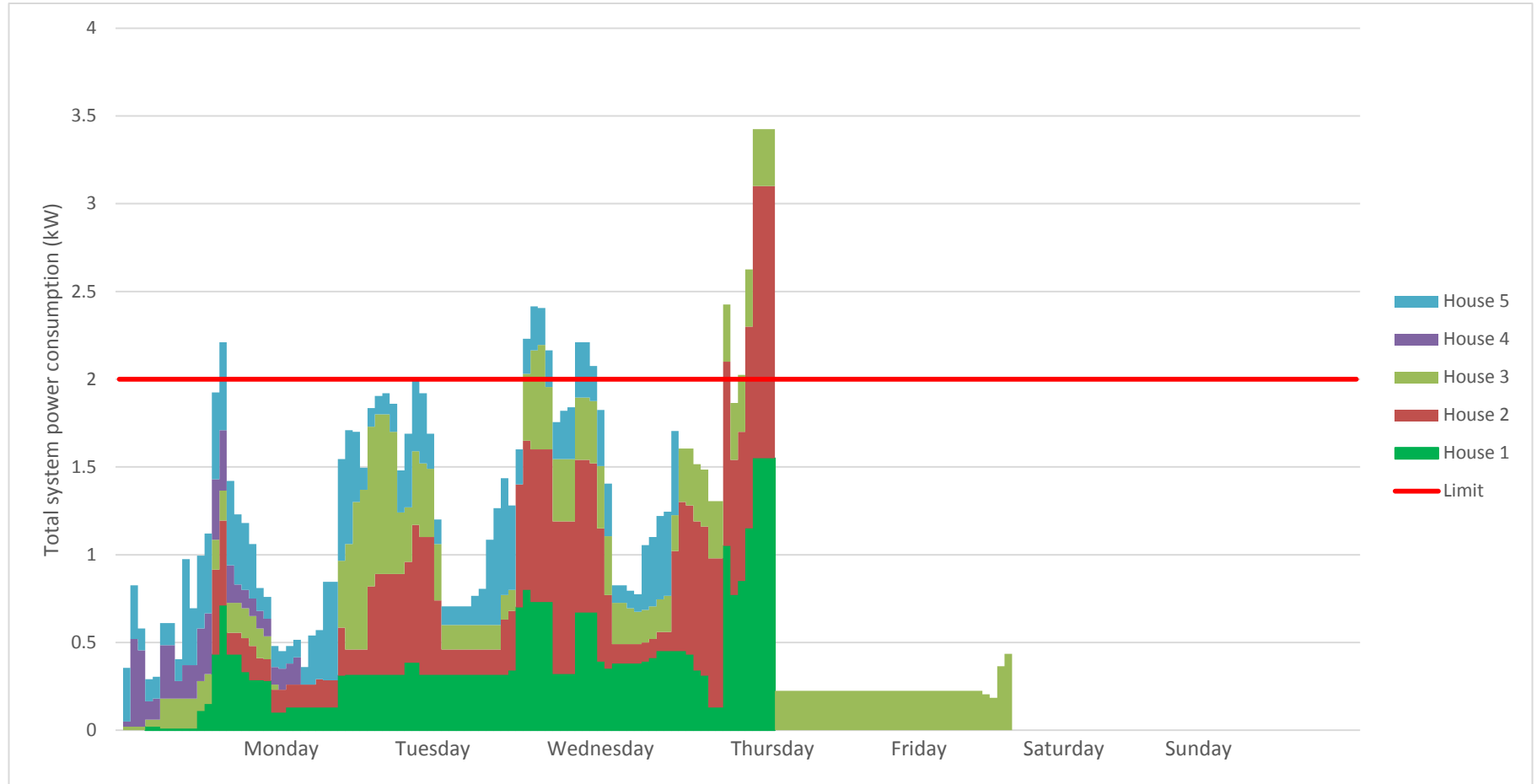
In order to plan system design and determine parameters

- System size
- Load regulations or demand side management
- Organizational, business, or ownership structure
- Tariff structure, cost recovery and community savings
- Future expansion of micro-grid

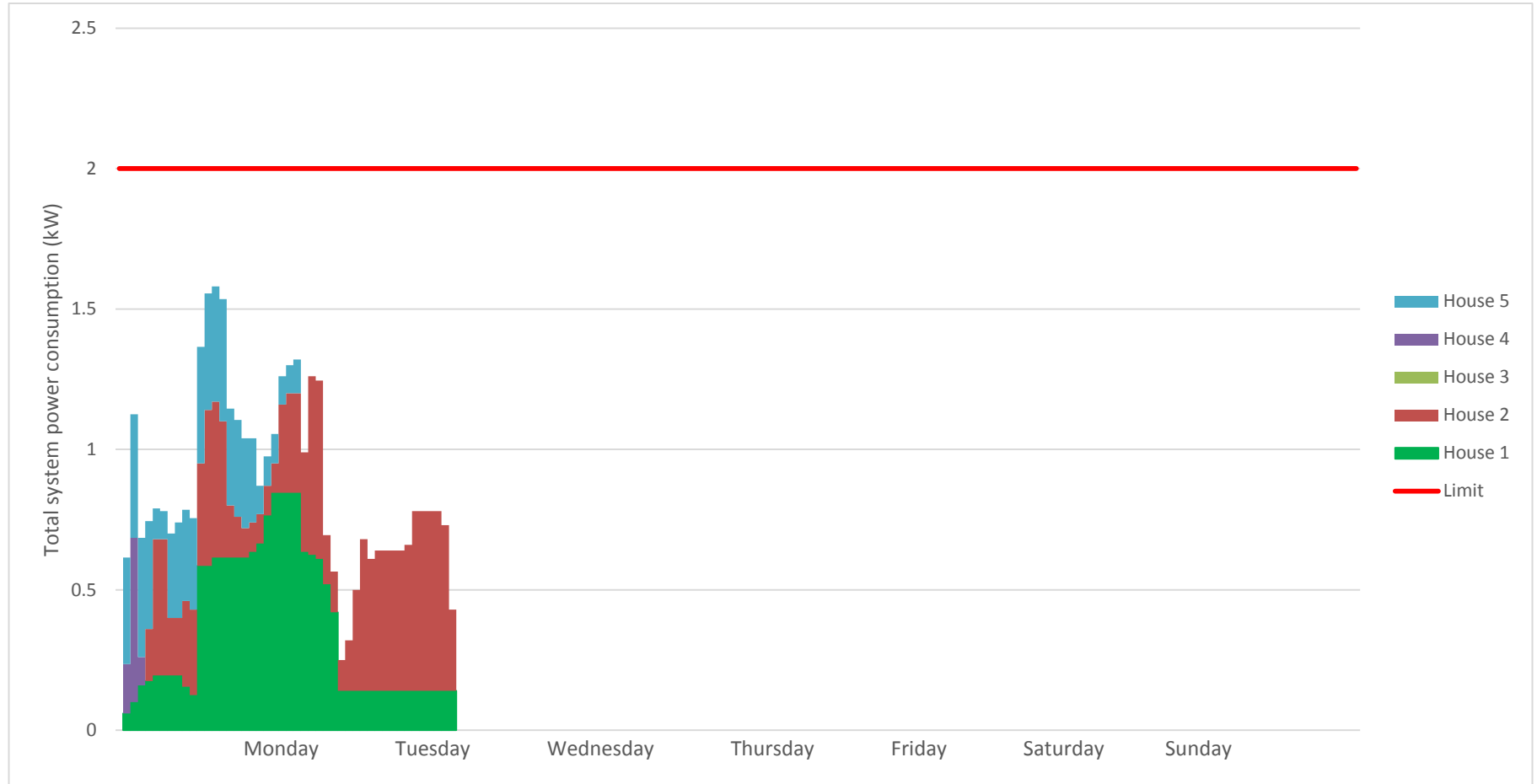
Beta version trial in Ladakh, India:

- Energy Access workshop
- 12 participants
- Young professionals and university students
- From both rural and urban areas

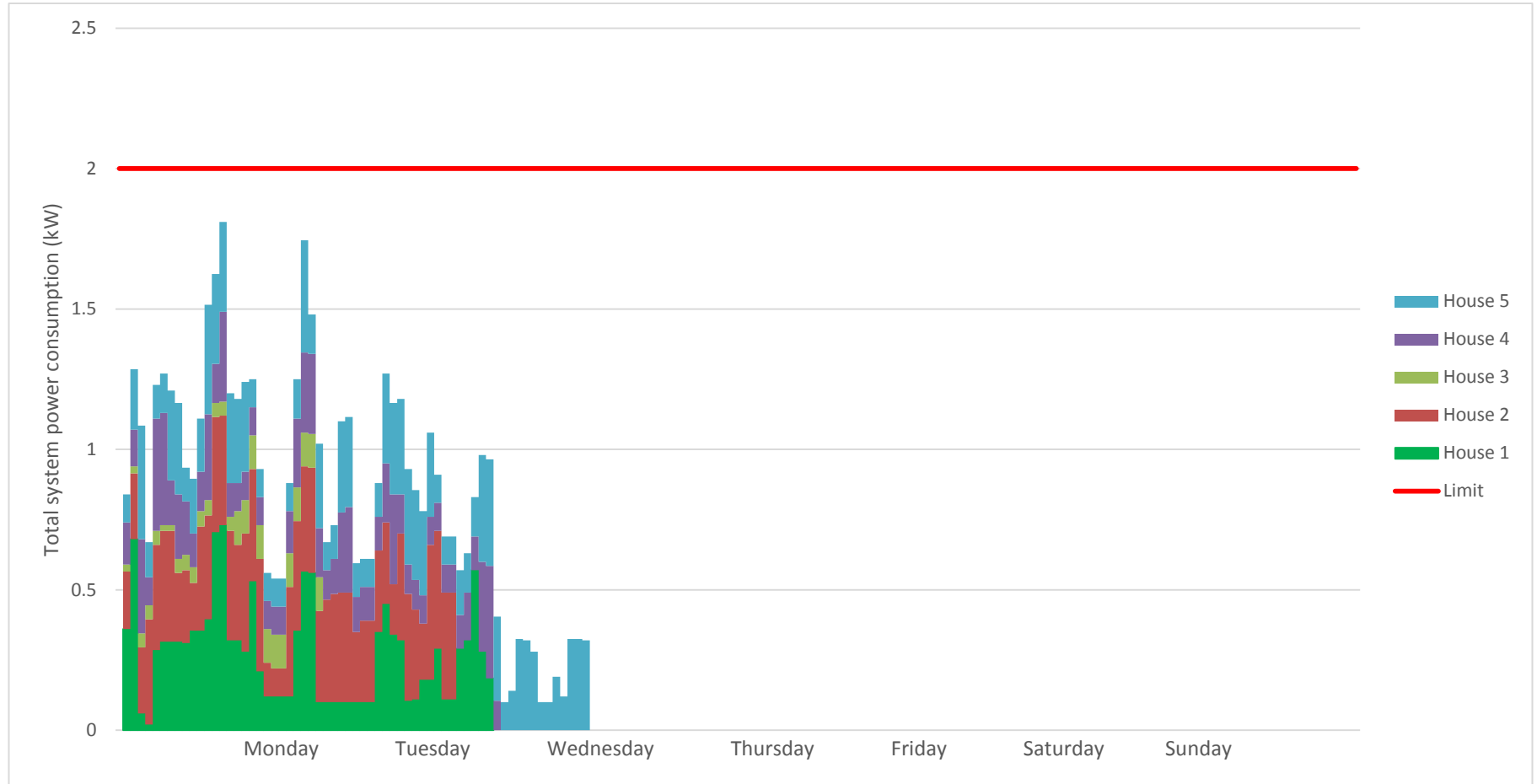




Round 1



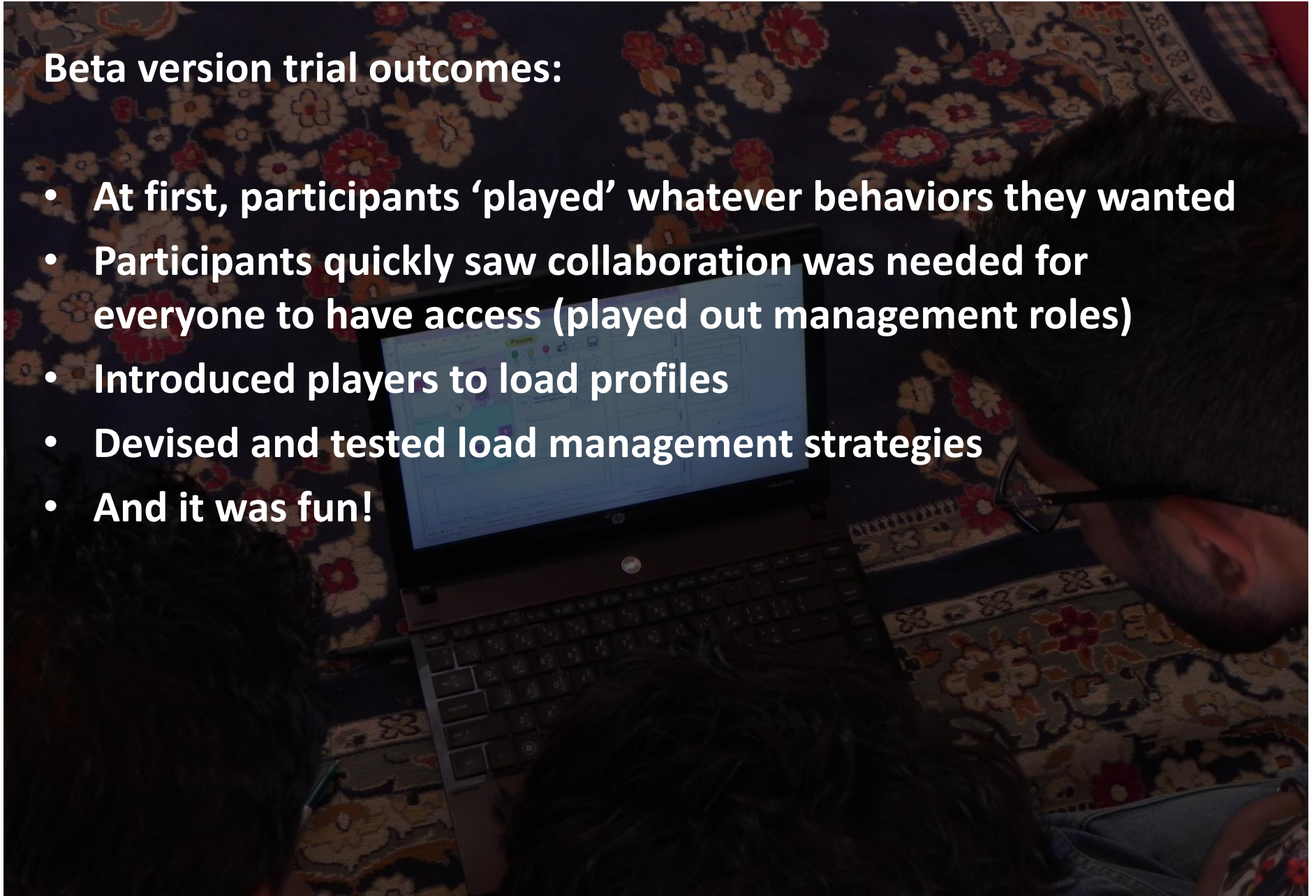
Round 2



Round 3

Beta version trial outcomes:

- At first, participants 'played' whatever behaviors they wanted
- Participants quickly saw collaboration was needed for everyone to have access (played out management roles)
- Introduced players to load profiles
- Devised and tested load management strategies
- And it was fun!



Conclusion:

- **There is a need for design and planning of micro-grids to go beyond the technical design, and to include social, economical factors and human development priorities**
- **The process of planning and designing the energy system can also be used to build capacities – community participation as a means and ends**

Future work:

- **The simulation gaming approach will be used in a community setting to plan an existing system next week in Ladakh, India**
- **Deploy the game on tablet devices**
- **Physical version of the game**

Services Energy Health Water
Human relationships INTEGRITY
Ethics **Capabilities** EQUITY
LIVELIHOODS Capacity building
Economic activity EDUCATION

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